

PCT COOPERATION TREATY

PCT

NOTIFICATION RELATING TO PRIORITY CLAIM

(PCT Rules 26bis.1 and 26bis.2 and
Administrative Instructions, Sections 402 and 409)

From the INTERNATIONAL BUREAU

To:

MANNESMANN VDO AG
Patent & Trademark Department
Kruppstrasse 105
D-60388 Frankfurt
ALLEMAGNE

Date of mailing (day/month/year)

25 May 2000 (25.05.00)

Applicant's or agent's file reference

4134 PCT

IMPORTANT NOTIFICATION

International application No.

PCT/EP00/01119

International filing date (day/month/year)

11 February 2000 (11.02.00)

Applicant

MANNESMANN VDO AG et al

The applicant is hereby notified of the following in respect of the priority claim(s) made in the international application.

1. ☒ **Correction of priority claim.** In accordance with the applicant's notice received on: 06 April 2000 (06.04.00), the following priority claim has been corrected to read as follows:

EP 26 May 1999 (26.05.99) 99 200 525.6

- ☐ even though the indication of the number of the earlier application is missing.
☐ even though the following indication in the priority claim is not the same as the corresponding indication appearing in the priority document:

2. ☐ **Addition of priority claim.** In accordance with the applicant's notice received on: , the following priority claim has been added:

- ☐ even though the indication of the number of the earlier application is missing.
☐ even though the following indication in the priority claim is not the same as the corresponding indication appearing in the priority document:

3. ☐ As a result of the correction and/or addition of (a) priority claim(s) under items 1 and/or 2, the (earliest) priority date is:

4. ☐ **Priority claim considered not to have been made.**

- ☐ The applicant failed to respond to the Invitation under Rule 26bis.2(a) (Form PCT/IB/316) within the prescribed time limit.
☐ The applicant's notice was received after the expiration of the prescribed time limit under Rule 26bis.1(a).
☐ The applicant's notice failed to correct the priority claim so as to comply with the requirements of Rule 4.10.

The applicant may, before the technical preparations for international publication have been completed and subject to the payment of a fee, request the International Bureau to publish, together with the international application, information concerning the priority claim. See Rule 26bis.2(c) and the PCT Applicant's Guide, Volume I, Annex B2(II).

5. ☐ In case where multiple priorities have been claimed, the above item(s) relate to the following priority claim(s):

6. A copy of this notification has been sent to the receiving Office and

- ☒ to the International Searching Authority (where the international search report has not yet been issued).
☒ the designated Offices (which have already been notified of the receipt of the record copy).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Authorized officer

Sean Taylor

Facsimile No. (41-22) 740.14.35

Telephone No. (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
US Department of Commerce
United States Patent and Trademark
Office, PCT
2011 South Clark Place Room
CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing: 07 December 2000 (07.12.00)	
International application No.: PCT/EP00/01119	Applicant's or agent's file reference: 4134 PCT
International filing date: 11 February 2000 (11.02.00)	Priority date: 26 May 1999 (26.05.99)
Applicant: MOERS, Paulus, Louis, Guido	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International preliminary Examining Authority on:
12 August 2000 (12.08.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer:

J. Zahra

Telephone No.: (41-22) 338.83.38

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

MANNESMANN VDO AG
Patent- und Markenabteilung
Kruppstrasse 105
D-60388 Frankfurt
ALLEMAGNE

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT
(PCT Rule 71.1)

Date of mailing
(day/month/year) 22.02.2001

Applicant's or agent's file reference
4134 PCT

IMPORTANT NOTIFICATION

International application No.
PCT/EP00/01119

International filing date (day/month/year)
11/02/2000

Priority date (day/month/year)
26/05/1999

Applicant
MANNESMANN VDO AG

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/

 European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized officer

Atienza Vivancos, B

Tel. +49 89 2399-7891



PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 4134 PCT	<div style="display: flex; justify-content: space-between;"> <div> FOR FURTHER ACTION </div> <div> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) </div> </div>	
International application No. PCT/EP00/01119	International filing date (<i>day/month/year</i>) 11/02/2000	Priority date (<i>day/month/year</i>) 26/05/1999
International Patent Classification (IPC) or national classification and IPC H03J1/00		
Applicant MANNESMANN VDO AG		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

I	<input checked="" type="checkbox"/> Basis of the report
II	<input type="checkbox"/> Priority
III	<input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
IV	<input type="checkbox"/> Lack of unity of invention
V	<input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
VI	<input type="checkbox"/> Certain documents cited
VII	<input checked="" type="checkbox"/> Certain defects in the international application
VIII	<input checked="" type="checkbox"/> Certain observations on the international application

Date of submission of the demand 12/08/2000	Date of completion of this report 22.02.2001
Name and mailing address of the international preliminary examining authority: <div style="display: flex; align-items: center;"> <div> European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 </div> </div>	Authorized officer Wright, J Telephone No. +49 89 2399 2705



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP00/01119

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).):*

Description, pages:

1-13 as originally filed

Claims, No.:

1-10 as originally filed

Drawings, sheets:

1/3-3/3 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/01119

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-10
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-10
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-10
	No:	Claims	

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP00/01119

The following documents will be referred to in this report:

D1: DE 41 12 705 A (PIONEER ELECTRONIC CORP) 31 October 1991 (1991-10-31)

D2: EP-A-0 333 194 (SANYO ELECTRIC CO ; TOKYO SANYO ELECTRIC CO (JP)) 20 September 1989 (1989-09-20) cited in the application

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Independent claims 1 and 6 relate respectively to a method and receiver where a tuning frequency is selected from a plurality of tuning frequencies. The applicant cites in the description document D2 which discloses selection of a next strongest frequency if the signal strength being received fails.

Document D1 is considered by the examiner to represent the closest prior art to that of the application since document D2 includes a time factor in the assessment of the next strongest signal, see in particular D1, col. 7, lines 4-40 and fig. 5.

In D1 in a first period channel data is stored which exceeds a given signal strength. In a later period only these previously stored channels are assessed for signal strength exceeding a different predetermined signal level.

2. The subject matter of the independent claims of the application differ from D1 in that it is claimed to allocate a permanency factor to stored signal data, and to base tuning frequency selection on this data. In D1 no such "permanency factor" can be said to be allocated to the stored data, since the data of D1 is either stored or it is not considered, as such claim 1 is new with respect to D1.
3. The technical consequence of this difference is that a more reliable channel can be selected, since data is added to the list stored pertaining to the historic reliability of the channel and this is used to select the channel. In D1 no such

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP00/01119

selection criteria is possible since there is no permanency factor.

4. The examiner is of the opinion that the subject matter of the independent claims is none obvious (involves an inventive step), there being no indications in any of the prior art which would appear to suggest adding a "permanency factor" to stored tuning data.
5. The examiner concludes that the independent claims 1 and 6 appear to fulfil the requirements of novelty and inventive step laid down in Art. 33(2) and (3) PCT respectively.
6. Dependent claims 1-5 and 7-10 would likewise appear to fulfil the requirements of Art. 33(2) and (3) since they depend on allowable claims.

Re Item VII

Certain defects in the international application

1. D1 should also have been mentioned in the description in accordance with Rule 5.1 a ii PCT.

Re Item VIII

Certain observations on the international application

1. The clarity of the claims would have been enhanced, had reference signs been added to the claims in accordance with Rule 6.2 b PCT.

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 4134 PCT	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP00/01119	International filing date (day/month/year) 11/02/2000	Priority date (day/month/year) 26/05/1999
International Patent Classification (IPC) or national classification and IPC H03J1/00		
Applicant MANNESMANN VDO AG		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 5 sheets, including this cover sheet.

- ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 12/08/2000	Date of completion of this report 22.02.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Wright, J Telephone No. +49 89 2399 2705 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/01119

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).):*

Description, pages:

1-13 as originally filed

Claims, No.:

1-10 as originally filed

Drawings, sheets:

1/3-3/3 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/01119

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims 1-10
	No: Claims
Inventive step (IS)	Yes: Claims 1-10
	No: Claims
Industrial applicability (IA)	Yes: Claims 1-10
	No: Claims

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP00/01119

The following documents will be referred to in this report:

D1: DE 41 12 705 A (PIONEER ELECTRONIC CORP) 31 October 1991 (1991-10-31)

D2: EP-A-0 333 194 (SANYO ELECTRIC CO ; TOKYO SANYO ELECTRIC CO (JP)) 20 September 1989 (1989-09-20) cited in the application

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Independent claims 1 and 6 relate respectively to a method and receiver where a tuning frequency is selected from a plurality of tuning frequencies. The applicant cites in the description document D2 which discloses selection of a next strongest frequency if the signal strength being received fails.

Document D1 is considered by the examiner to represent the closest prior art to that of the application since document D2 includes a time factor in the assessment of the next strongest signal, see in particular D1, col. 7, lines 4-40 and fig. 5.

In D1 in a first period channel data is stored which exceeds a given signal strength. In a later period only these previously stored channels are assessed for signal strength exceeding a different predetermined signal level.

2. The subject matter of the independent claims of the application differ from D1 in that it is claimed to allocate a permanency factor to stored signal data, and to base tuning frequency selection on this data. In D1 no such "permanency factor" can be said to be allocated to the stored data, since the data of D1 is either stored or it is not considered, as such claim 1 is new with respect to D1.
3. The technical consequence of this difference is that a more reliable channel can be selected, since data is added to the list stored pertaining to the historic reliability of the channel and this is used to select the channel. In D1 no such

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP00/01119

selection criteria is possible since there is no permanency factor.

4. The examiner is of the opinion that the subject matter of the independent claims is none obvious (involves an inventive step), there being no indications in any of the prior art which would appear to suggest adding a "permanency factor" to stored tuning data.
5. The examiner concludes that the independent claims 1 and 6 appear to fulfil the requirements of novelty and inventive step laid down in Art. 33(2) and (3) PCT respectively.
6. Dependent claims 1-5 and 7-10 would likewise appear to fulfil the requirements of Art. 33(2) and (3) since they depend on allowable claims.

Re Item VII

Certain defects in the international application

1. D1 should also have been mentioned in the description in accordance with Rule 5.1 a ii PCT.

Re Item VIII

Certain observations on the international application

1. The clarity of the claims would have been enhanced, had reference signs been added to the claims in accordance with Rule 6.2 b PCT.

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 4134 PCT	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/EP 00/ 01119	International filing date (day/month/year) 11/02/2000	(Earliest) Priority Date (day/month/year) 23/02/1999
Applicant MANNESMANN VDO AG		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established by this Authority to read as follows:

METHOD FOR SELECTION OF A RECEIVER TUNING FREQUENCY

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

1

☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/JP 00/01119

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 H03J1/00 H03J7/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H03J H04H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 333 194 A (SANYO ELECTRIC CO ; TOKYO SANYO ELECTRIC CO (JP)) 20 September 1989 (1989-09-20) cited in the application abstract	1-10
A	DE 41 12 705 A (PIONEER ELECTRONIC CORP) 31 October 1991 (1991-10-31) claim 2	1-10
A	EP 0 459 360 A (GRUNDIG EMV) 4 December 1991 (1991-12-04) column 4, line 41 - column 6, line 36; claim 2	6-8, 10
A	US 5 457 815 A (MOREWITZ II HERBERT) 10 October 1995 (1995-10-10) column 4, line 20 - line 39	4, 9



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

21 June 2000

Date of mailing of the international search report

28/06/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
 Fax: (+31-70) 340-3016

Authorized officer

Peeters, M

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

P 00/01119

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0333194 A	20-09-1989	AT 154733 T DE 68928131 D DE 68928131 T JP 2124648 A JP 2760552 B KR 9608949 B	15-07-1997 24-07-1997 15-01-1998 11-05-1990 04-06-1998 10-07-1996
DE 4112705 A	31-10-1991	JP 4004615 A GB 2244615 A, B US 5303400 A	09-01-1992 04-12-1991 12-04-1994
EP 0459360 A	04-12-1991	DE 4017756 A DE 59106704 D	05-12-1991 23-11-1995
US 5457815 A	10-10-1995	NONE	

Method for selection of a receiver tuning frequency

The invention relates to a method for selecting a tuning frequency for receiving an RF transmitter within an RF frequency band and an FM receiver executing the method.

An FM receiver executing the above method is on itself known e.g. from European Patent 0 333 194. The known FM receiver complies with the FM RDS broadcasting standard as defined in 'Specification of the Radio Data System FM RDS for VHF-FM Sound Broadcasting' by the European Broadcasting Union (EBU), EBU document Tech 3244-E, March 1984 and updated in the subsequent revisions thereof. Reference is made to this document for a correct understanding of the meaning and definition of the various terms used hereinafter in connection with the FM RDS standard.

The cited FM receiver comprises a first or stationary tuner circuit and a second or scanning tuner circuit. The stationary tuner circuit is used to tune the receiver to a broadcast transmitter station with a wanted audio program, hereinafter indicated as first transmitter frequency, and to process the audio program signals for sound reproduction. If the transmitter transmits RDS data as well, then the stationary tuner circuit will also extract the RDS data carried by the received RDS transmitter signal, in particular a list of alternative frequencies (AFs). Such list provides tuning data of transmitters carrying the same program as the one the stationary tuner circuit is actually tuned to. The scanning tuner circuit is used to monitor the reception quality of the transmitter signals at each of those AFs. For this, the scanning tuner circuit is sequentially switched to each AF in the AF list to measure the fieldstrength of the transmitter signals at the respective AFs. The fieldstrength information is stored in a memory and repeatedly updated in sequential scan cycles. On deterioration of the received stationary transmitter signal, hereinafter indicated as first transmitter frequency, the

stationary tuner circuit is automatically switched over in its tuning from said first transmitter frequency to another transmitter frequency, hereinafter indicated as second transmitter frequency. In the known receiver, the AF stored
5 in the memory having highest fieldstrength is chosen to be such second transmitter frequency. However, the reception quality measurement is based on the momentary fieldstrength of the RF FM reception signal and the AF having highest fieldstrength at the moment of tuning switch over may lose
10 this position very quickly, due to fluctuations in the environmental reception conditions. This may cause instabilities in the tuning of the receiver. Furthermore, in this known receiver, the selection of a second transmitter frequency is limited to the AFs included in the RDS AF list,
15 being alternative frequencies carrying the same audio program as the first transmitter frequency.

An object of the invention is to improve the tuning behaviour of the above mentioned receiver.

To this end, a method for selecting a tuning frequency
20 for receiving an RF transmitter within an RF frequency band is characterized by a band scanning search for detecting transmitters exceeding a predetermined reception quality level, by storing the tuning data thereof and allocating thereto a permanency factor indicating the permanency in
25 reception quality thereof, said tuning frequency being selected on the basis of at least said permanency factor.

An FM receiver executing the method according to the invention comprising first and second tuner circuits
30 respectively for receiving a first FM transmitter and for detecting in an FM band FM transmitters received with a reception quality exceeding a predetermined quality threshold level, and storage means for storing the tuning data of the so detected FM transmitters, the first tuner
35 circuit switching over from an actually received first FM transmitter to a second FM transmitter selected from the

detected FM transmitters when the reception quality of the first FM transmitter decreases below a predetermined level, is therefore characterized by a processing unit allocating to each detected FM transmitter a permanency factor
5 indicating the permanency in reception quality thereof, said selection of the second FM transmitter being based on at least said permanency factor.

By the measure according to the invention the criteria for selecting a second transmitter are not only based on the
10 reception quality or fieldstrength thereof, but also on the duration or permanency of the reception quality. The longer the reception quality is in excess of said predetermined minimum level, the more reliable and stable the reception of the transmitter signal in question is. By tuning the
15 stationary tuner circuit to such a transmitter, the tuning behaviour of the stationary tuner will be stabilised.

To allow easy implementation, the method is preferably characterized in that the band scanning search is being repeated in subsequent scan cycles, each detected
20 transmitter increasing respectively decreasing in permanency factor dependent on the detection respectively the absence of detection thereof in subsequent scan cycles.

An FM receiver executing said preferred method is characterized by tuning control means controlling the tuning
25 of the second tuning circuit to repeat the band scanning search in subsequent scan cycles, the processing unit increasing, respectively decreasing, stepwise the permanency factor of a transmitter at each detection, respectively in the absence of detection, thereof in a subsequent scan
30 cycle.

In a further preferred method the tuning data of transmitters having a permanency factor decreasing below a predetermined permanency threshold level are being erased to exclude such transmitters from being selected.

35 An FM RDS receiver executing said preferred method is characterized in that the storage locations of tuning data

relating to transmitters decreasing in permanency factor below a predetermined permanency threshold level, being released for storage of other transmitter data.

This measure further improves the efficiency in the use of memory capacity without losing the information which transmitter frequency should be chosen in case the actually received transmitter signal decreases below said predetermined threshold level.

Furthermore, the band scanning search will reveal all transmitters in the FM band meeting the minimum reception quality requirement. This allows to apply said selection of the second transmitter frequency also when changes in the audio program are permitted or wanted. Dependent on the user's choice, such second transmitter frequency may carry an audio program signal different from the actually received one, but falling e.g. within the same PTY category, and/or including traffic messages. The selection is therewith PTY determined. RDS program codes may be used for the identification of such audio programs.

In an FM receiver capable of receiving RDS signals implementing such selection the processing unit repeatedly monitors the permanency factor of the FM transmitters carrying an audio program within the same PTY category as the audio program of the first FM transmitter.

In another preferred method according to the invention the second transmitter is selected from FM transmitters carrying traffic messages on the basis of fieldstrength in addition to the permanency factor.

In an FM receiver capable of receiving RDS signals executing this method the processing unit operates to monitor the permanency factor of FM transmitters carrying traffic message information as well as the fieldstrength thereof, the second FM transmitter being selected from the detected FM transmitters upon receiving a traffic

announcement signal on the basis of fieldstrength in addition to the permanency factor.

The fieldstrength is used in this measure to identify the nearest transmitter sending traffic messages, which are most relevant to the actual location of the user because of the proximity of the transmitter.

These and further aspects and advantages of the invention will be discussed in more detail hereinafter with reference to the disclosure of preferred embodiments, and in particular with reference to the appended Figures that show:

Figure 1 a blockdiagram of a dual tuner FM RDS receiver according to the invention;

Figure 2 an organisational scheme of the list of transmitter related data as stored in the FM RDS receiver of Figure 1;

Figure 3 a flowchart illustrating the method according to the invention as being executed by the FM RDS receiver of Figure 1.

Figure 1 shows a blockdiagram of an FM receiver according to the invention, which in the preferred embodiment as shown complies with the FM RDS broadcasting standard as defined in above cited EBU document. Reference is made to this document for detailed information on the meaning and definition of the various terms and abbreviations relating to the RDS standard, as mentioned hereinafter.

The FM receiver receives RF FM signals through an antenna 1 and following this antenna 1, it comprises first and second tuner circuits 2 and 3, the tuning frequency thereof being controlled from tuning control means 10, 11, 25. The tuning control means 10, 11, 25 comprise a central processing unit (CPU) 25 and an I/O control module 11 being included in a microprocessor 12 and connected through a control bus 10 to the first and second tuner circuits 2 and

3. By manual operation of one of keys 21-24 the tuning frequency of the first tuner circuit 2 can be set through a user interface I/O module 20 to the transmitter frequency of a wanted FM broadcast station. Key 21 is to activate an autostore functionality, key 22 is to activate an up/down search, key 23 is to switch on/off the reception of traffic messages and key 24 is to activate a search for programs within the same PTY category as the one actually received. These functionalities require the use of a program memory 26 for the storage of program software and a timer module 28 and are on themselves already known from e.g. the FM RDS radio receiver type VDO RC 959 RDS. The first tuner circuit 2 provides for the stationary selection and demodulation of a wanted RF FM broadcast signal into baseband and comprises means to measure the reception quality of the received FM RF signal. A quality factor reflecting said reception quality is supplied via a quality level line 14 to an AD converter module 15 of the microprocessor 12 to be further processed as described hereinafter.

Dependent on the content of the received FM broadcast signals, the baseband FM modulation signal may comprise an RDS signal and/or a mono or stereomultiplex signal. This baseband signal is supplied via a signal line 5 from an output of the first tuner circuit 2 to a digital signal processor 6. The digital signal processor 6 comprises audio signal processing means (not shown) to process mono audio signals and eventually demultiplex stereomultiplex signals into stereo left and right audio signals. These stereo left and right audio signals are supplied to an audio amplifier 8 and subsequently to a stereo loudspeaker set 9 for respectively amplification and reproduction thereof.

The digital signal processor 6 is coupled to an RDS decoder 7 to decode RDS data contained in the received FM broadcast signal. The decoded RDS data are supplied via an RDS data line 18 to an RDS data I/O module 19 of the

microprocessor 12. RDS data processing occurs under control of the CPU 25 of the microprocessor 12.

The tuning frequency of the second tuner circuit 3 is automatically varied by the tuning control means 10, 11, 25 to scan over the full RF FM broadcast reception band ranging from 87.5 MHz to 108 MHz, starting from e.g. the lower end of said RF FM band. The scanning operation will be interrupted upon first reception of an FM broadcast station fx having a signal reception quality exceeding a certain predetermined threshold level qt (hereinafter also indicated as scan hit). During an interruption interval, measurement, processing and storage steps are being made under control of the CPU 25, as described in the following with reference to Figure 2.

1. the tuning data of fx is stored at a storage address Tx of a data memory 27 of the microcontroller 12;

2. a permanency factor px is being allocated to fx; set at unity value and stored at Tx;

3. the actual reception fieldstrength is measured and a fieldstrength factor sx reflecting said reception fieldstrength is stored at Tx;

An RDS decoder 4 following the output of the second tuner circuit 3 is to extract RDS data from the demodulated RDS signal, if fx is carrying such RDS data. The RDS data is supplied via an RDS data line 16 to an RDS data I/O module 17 of the microprocessor 12 and the various program related RDS codes included therein, such as e.g. the PTY-, TA-, TMC-, PS-, and/or PS Mask codes, are stored in said data memory at the storage address Tx of fx. Eventually an RDS flag NW identifying RDS transmitters with value 1 and non-RDS transmitters with value 0 may be stored in TX as well.

After these steps have been completed for fx, the scanning is resumed until it is interrupted again, when the next FM broadcast station fy in the RF FM broadcast reception band having a signal reception quality exceeding

qt is detected. The above measurement, processing and storage steps are repeated for fy, the tuning data thereof, as well as a permanency factor py and a fieldstrength factor sy, eventually along with RDS program data are being stored in the data memory at storage address Ty. These steps are repeated for each such FM broadcast station until the full RF FM broadcast reception band has been scanned, whereafter the scanning operation is repeated, either in the same or in reversed scan direction.

The reception quality may be based on one or more parameters, such as e.g. the reception fieldstrength, the (lack of) multipath and other environmental sources of pollution. The above predetermined threshold level qt is chosen such, that RF FM broadcast signals exceeding this level can be processed properly without giving rise to receiver malfunctioning and/or noticeable signal distortions.

For a practical implementation of the detection of FM broadcast stations having a signal reception quality exceeding a certain predetermined threshold level qt, reference is made to above cited car radio receiver type VDO RC 959 RDS, where a similar feature is used under its so-called autostore functionality. Said known receiver also provides a reference for the measuring of the actual reception fieldstrength of certain transmitters and the storage of a fieldstrength factor sx reflecting said reception fieldstrength, the retrieval of various program related RDS codes included in the received RF FM signal, such as e.g. the PTY, TA-, TMC-, PS-, and/or PS Mask codes and the storage of these data in a data memory at storage addresses related to the relevant transmitter frequencies. The known receiver is based on a single tuner concept and provides said functionalities during short muting intervals in the reproduction of the main audio program being limited to AFs only, i.e. transmitter frequencies carrying the same audio program as the stationary received one.

If in a subsequent scan operation fx is detected again, which means that the reception quality of fx still exceeds the predetermined threshold level qt , then the permanency factor px is incremented with unity value, thus resulting in $px=2$. A maximum to the permanency factor can be set, e.g. at three, which means that any scan hits on fx following up to the third one in a row will have no effect on this maximum value of $px=3$.

If after a scan hit, fx fails to appear in a subsequent scan (hereinafter also indicated as an empty scan), then px will decrement with unity value, each time a subsequent scan appears to be empty on fx . The minimum value of px is set at $px=0$, which is obtained in at most three empty scans in a row. Any empty scan following the third one in a row, will have no effect on this minimum value of $px=0$. If px decreases below a permanency threshold level, which in this receiver is set at $px=1$ (unity), then all data in the data memory at the storage address Tx of fx will be removed. This removal of data is in practise effected by releasing the relevant storage locations for the storage of new data.

As long as px differs from zero, the last measured fieldstrength factor sx is stored at the storage address Tx of fx , while overwriting the prior one.

In contrast with said known receiver, the second tuner circuit 3 of the FM receiver according to the invention collects not only transmitter data of AFs only, but of all transmitters exceeding the predetermined reception quality level qt . This allows to offer the user a broader range of options in automatically selecting audio programs.

For instance, by activating the 'autostore' option with key 21, the fieldstrength factor of the various transmitters stored in the data memory may be compared with a certain threshold level, chosen such that it is exceeded by only a limited number of transmitters (e.g. 10), which can be RDS- or non-RDS transmitters. The tuning data of these transmitters are stored in the autostore memory and called

up by touching the key 21. According to the invention the threshold level may be based on a predetermined threshold value for the permanency factor, eventually in combination with a predetermined threshold value for the fieldstrength factor.

5 This also applies to the threshold level for use in the up/down search of transmitters, which feature can be activated with key 22.

The various program related RDS codes like PTY, TP and TA are used to offer the user options in automatically
10 selecting within the category of programs indicated therewith, the best receivable transmitter from those having these codes stored in the data memory of the receiver. The availability of the tuning data of all receivable transmitters in the data memory of the receiver, together
15 with the permanency factor and the fieldstrength factor thereof allow to immediately identify within a certain RDS program category, which in terms of these factors is the best to receive transmitter.

A switching of the tuning of the first tuner circuit 2
20 to the best to receive transmitter carrying a program within the same PTY category as the one the first tuner is actually tuned to, is activated with key 24.

By an operation of key 23, the receiver can be set to reproduce traffic messages. In accordance with the
25 invention, the criterium to select an appropriate traffic message transmitting RDS broadcast station amongst those carrying the traffic announcement flag is based on the permanency factor, i.e. the best to receive RDS traffic message broadcast station having the highest permanency
30 factor. If the highest permanency factor is shared by various transmitters, then the fieldstrength factor may additionally be used to come to the one best to receive. The transmitter received strongest (i.e. with highest fieldstrength) is in practice nearest to the receiver
35 location and the traffic messages of that transmitter are therewith most relevant to the user.

Figure 3 shows a flowchart of an algorithm for collecting and updating transmitter and RDS program related data to be used in a method for tuning the reception of radio broadcast signals to an FM transmitter in accordance with the invention, in which steps a1-a15 have the following meaning:

a1 Switching on the radio and starting the method according to the invention.

10 for selecting a tuning frequency for receiving an RF FM transmitter within an RF FM frequency band

a2 The second tuner circuit 3 is initialised for starting a scan cycle from the lower end of the FM frequency band at 87.5 MHz. The data memory 27 is initialised for transmitter and RDS program related data storage .

a3 The tuning frequency of the second tuner circuit 3 is being increased to scan the FM and interrupted upon reception of a transmitter fx. During an interruption period the signal reception quality (this can be the fieldstrength or other parameters defining the reception quality level) of fx is measured. In the following the fieldstrength is taken as a measure for the reception quality. Store a fieldstrength factor sx reflecting the fieldstrength of fx at a storage address Tx of the data memory 27.

a4 If the fieldstrength factor sx exceeds the threshold level qt then go to a9. Otherwise go to a5.

a5 The fieldstrength factor sx is not good enough. Check now the permanency factor px of fx. If this px is not equal to zero (which means fx has been detected in at least the preceding scan), then goto a6. If px=0 then goto a7.

a6 Decrement px with unity value.

35 a7 px=0: clear all data from the storage address Tx of the data memory 27.

a8 Resume the scanning operation. If the end of the FM band (108,0 MHz) is reached, go to a3 to start a subsequent scan cycle, starting again from the lower end of the FM band (87.5 MHz).

5 a9 The fieldstrength factor s_x exceeds q_t . Wait some time to check whether f_x carries RDS information.

a10 Is the PI code received. If so, go to a11, otherwise go to a 12.

10 a11 Set the RDS flag NW at 1 and store all RDS data at Tx of data memory 27.

a12 Check the RDS flag NW at Tx. If NW=1, go to a13, otherwise go to a14.

a13 Clear the RDS flag by setting NW to 0.

a14 Clear all RDS data at Tx

15 a15 The reception quality was OK. Increment p_x with unity value (until maximum at $p_x=3$ has been reached).

The data memory 27 therewith contains at any time the
20 most recent status of the receivable transmitters in the FM band in terms of momentary reception quality or fieldstrength s_x and permanency or stability of reception quality p_x . The continuous availability of the abovementioned transmitter related data in an FM receiver
25 according to the invention allows to determine immediately which transmitter within the FM band provides optimal reception conditions, i.e. which transmitter within the FM band has highest permanency factor p_x . If the highest p_x value is shared by several transmitters, then the
30 fieldstrength factor s_x may be taken additionally to determine the best to receive transmitter. The availability of program related RDS data allows to restrict the group of transmitters to be considered for the above determination of the best to receive transmitter. If, for instance, the user
35 is only interested in hearing a specific audio program with optimal quality, then in accordance with the invention it

should be determined, which transmitter having the PI code identifying said specific audio program has highest permanency factor p_x amongst those detected within the FM band. Similarly, the group of transmitters to be considered for the above determination in case the user is interested in any audio program within a certain PTY category, is limited to those transmitter carrying the RDS PTY code of said category. Accordingly, in determining the best to receive traffic message broadcast transmitter station, use can be made of the RDS TA code to limit the group of transmitters to be considered therefor.

The invention is not restricted to the embodiments described above and may well be used in e.g. a non-RDS receiver for implementing an 'autostore' functionality, wherein a number of strongest transmitters are being stored under a same number of tuner preselection keys. Furthermore, the functions of the first and second tuner circuits 2 and 3 may well be performed with a single tuner, in which the stationary reception is repeatedly shortly interrupted to allow the tuner during each interruption period to scan through a part of the FM band covering the whole FM band after a number of interruption periods.

Claims:

1. Method for selecting a tuning frequency for receiving an RF transmitter within an RF frequency band characterized by a band scanning search for detecting transmitters exceeding a predetermined reception quality level, by storing the tuning data thereof and allocating thereto a permanency factor indicating the permanency in reception quality thereof, said tuning frequency being selected on the basis of at least said permanency factor.

2. Method according to claim 1, characterized in that the band scanning search is being repeated in subsequent scan cycles, each detected transmitter increasing respectively decreasing in permanency factor dependent on the detection respectively the absence of detection thereof in subsequent scan cycles.

3. Method according to claim 2, characterized by erasing the tuning data of transmitters having a permanency factor decreasing below a predetermined permanency threshold level.

4. Method according to one of claims 1 to 3, characterized by an RF transmitter being selected from detected transmitters carrying audio programs belonging to a predetermined PTY category.

5. Method according to one of claims 1 to 3, characterized by an RF transmitter being selected from detected FM transmitters carrying traffic messages on the basis of fieldstrength in addition to the permanency factor.

6. FM receiver comprising first and second tuner circuits respectively for receiving a first FM transmitter and for detecting in an FM band FM transmitters received with a reception quality exceeding a predetermined quality threshold level, and storage means for storing the tuning data of the so

detected FM transmitters, the first tuner circuit switching over from an actually received first FM transmitter to a second FM transmitter selected from the detected FM transmitters when the reception quality of the first FM transmitter decreases below a predetermined level, characterized by a processing unit allocating to each detected FM transmitter a permanency factor indicating the permanency in reception quality thereof, said selection of the second FM transmitter being based on at least said permanency factor.

7 FM receiver according to claim 6, characterized by tuning control means varying the tuning of the second tuner circuit to repeat the band scanning search in subsequent scan cycles, the processing unit increasing, respectively decreasing, stepwise the permanency factor of a transmitter at each detection, respectively in the absence of detection, thereof in a subsequent scan cycle.

8 FM receiver according to claim 7, characterized in that the storage locations of tuning data relating to transmitters decreasing in permanency factor below a predetermined permanency threshold level, being released for storage of other transmitter data.

9 FM receiver according to one of claims 6 to 8 capable of receiving RDS signals, characterized in that in selecting the second FM transmitter the processing unit continuously monitors the permanency factor of the FM transmitters carrying an audio program in the same PTY category as the audio program of the first FM transmitter.

10. FM receiver according to claim 6 or 8 capable of receiving RDS signals, characterized in that the processing unit operates to monitor the permanency factor of FM transmitters carrying traffic message information as well as the fieldstrength thereof, the

second FM transmitter being selected from the detected FM transmitters upon receiving a traffic announcement signal on the basis of fieldstrength in addition to the permanency factor.

2 / 3

RDS freq 0
(87.5 MHz)

RDS freq 205
(108.0 MHz)

T...	T1	T2	Tx	Ty	
	<div><div>f1</div><div>p1:1 NW:0 s1:16</div><div>PI=0, PTV=0, TA=0, TMC=0, PS="...", PS_MASK</div></div>	<div><div>f2</div><div>p2:3 NW:1 s2:14</div><div>PI=841C PTV=0, TA=0, TMC=0, PS="BRAB./Z0", PS_MASK</div></div>	<div><div>fx</div><div>px:1 NW:1 sx:16</div><div>PI=8301, PTV=2, TA=1, TMC=0, PS="Radio 3", PS_MASK</div></div>	<div><div>fy</div><div>py:2 NW:1 sy:12</div><div>PI=8301, PTV=2, TA=1, TMC=0, PS="Radio 3", PS_MASK</div></div>	

Fig. 2

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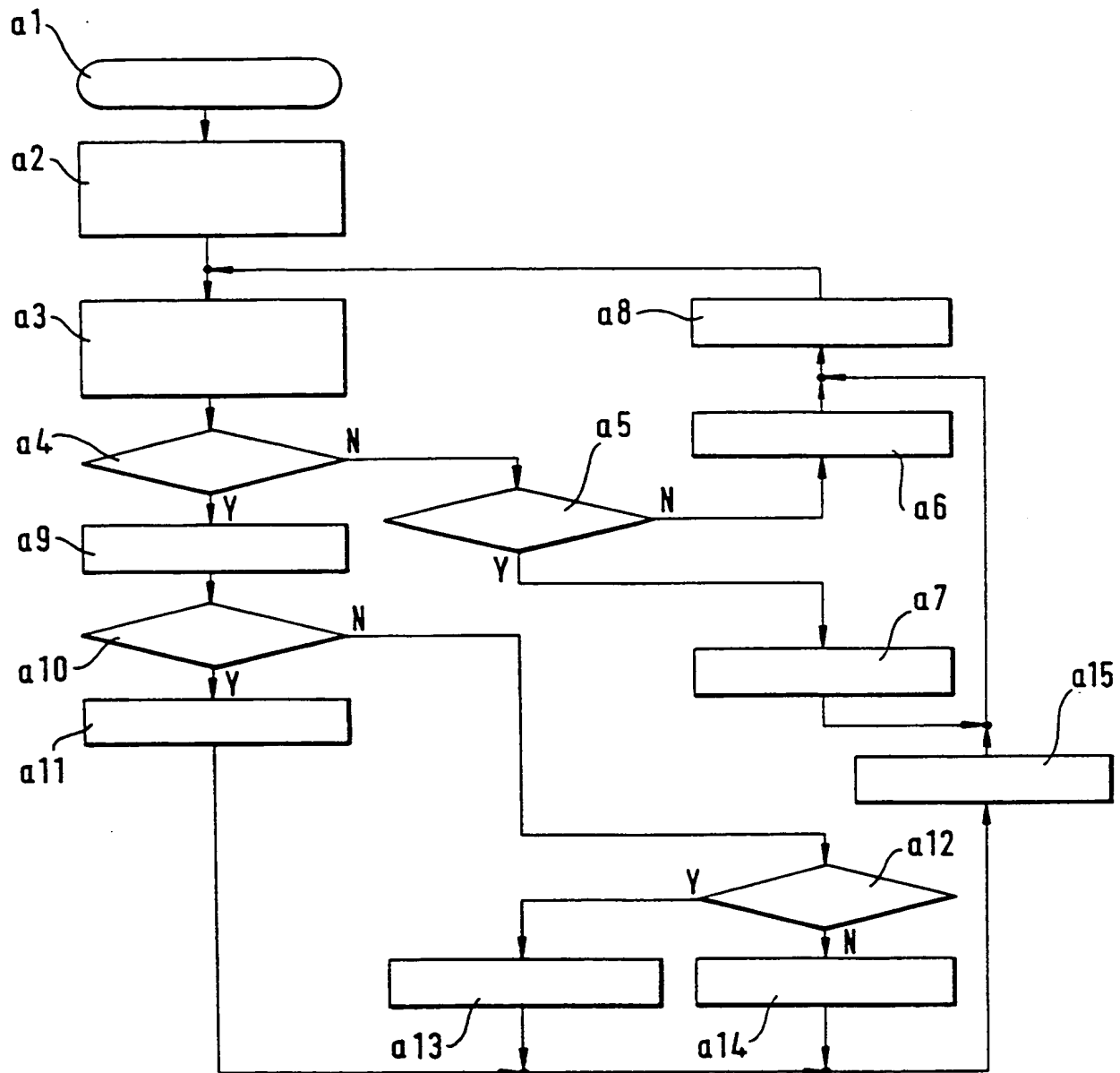


Fig. 3

INTERNATIONAL SEARCH REPORT

Inter Application No

PCT/EP 00/01119

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H03J1/00 H03J7/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H03J H04H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 333 194 A (SANYO ELECTRIC CO ;TOKYO SANYO ELECTRIC CO (JP)) 20 September 1989 (1989-09-20) cited in the application abstract	1-10
A	DE 41 12 705 A (PIONEER ELECTRONIC CORP) 31 October 1991 (1991-10-31) claim 2	1-10
A	EP 0 459 360 A (GRUNDIG EMV) 4 December 1991 (1991-12-04) column 4, line 41 -column 6, line 36; claim 2	6-8,10
A	US 5 457 815 A (MOREWITZ II HERBERT) 10 October 1995 (1995-10-10) column 4, line 20 - line 39	4,9

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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- *G* document member of the same patent family

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INTERNATIONAL SEARCH REPORT

information on patent family members

Inte Application No

PCT/EP 00/01119

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